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(71) Applicants: MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133-3427 (US). TANDBERG DATA STORAGE AS [NO/NO]; P.O. Box 134, Kjelsås, N-0411 Oslo (NO).

(72) Inventors: OLSON, Alan, R.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). MOLSTAD, Richard, W.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). HAMERLY, Michael, E.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). TAPANI, Robert, W.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). JEWETT, Richard, E.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). SCHWARZ, Theodore, A.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). PAHR, Per, Olaf; P.O. Box 134, Kjelsås, N-0411 Oslo (NO). SEEMAN, Steven, R.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US).

(74) Agents: DENNIS, Charles, L., II et al.; Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).

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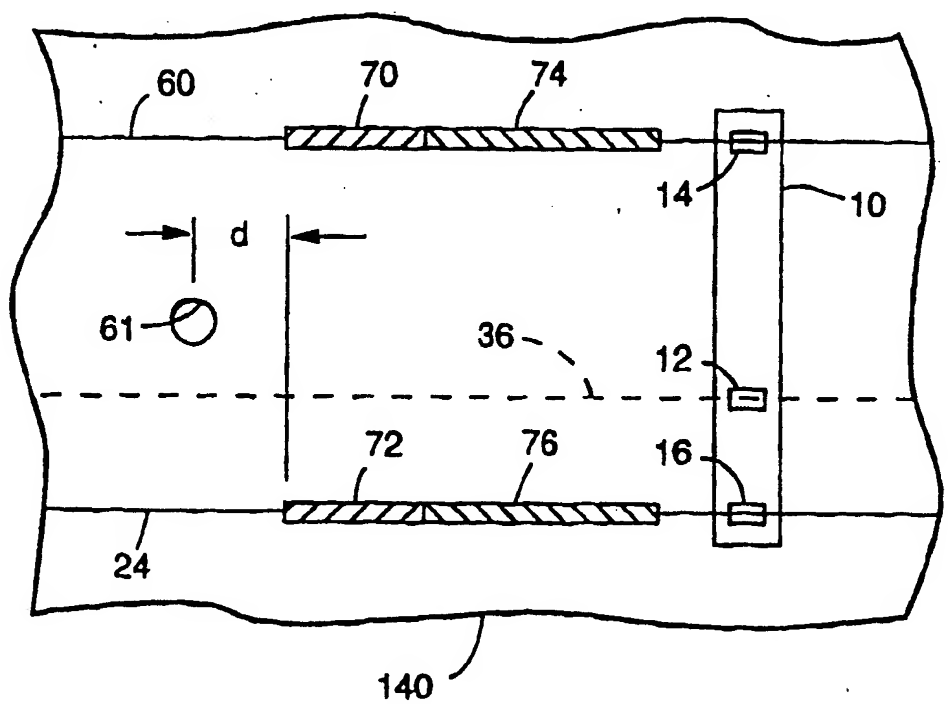

QUANT007644

(57) Abstract

A magnetic recording tape (140) has recorded at at least one end of each of a plurality of longitudinal tracks (24, 60) therealong at least one frame (70, 72) of digitally encoded data representing the identity of each specific track. A recording/playback head assembly (12, 14, 16) is transversely positioned with respect to a longitudinal transport path along which the tape may be moved. The transverse position of the recording/playback head assembly may be monitored in response to the track identification data, to ensure positioning of the head assembly at a desired track (24, 60), to prevent recording onto an incorrect track, and to prevent playing back data from an incorrect track.

METHOD AND APPARATUS FOR TAPE TRACK IDENTIFICATION

FIELD OF THE INVENTION

The present invention relates to data cartridge tape drives and, more particularly, to a tape track identification method for data cartridge tape drives using a positioning mechanism for multichannel recording/playback head assemblies.

BACKGROUND OF THE INVENTION

Data cartridge tape systems have for some time included preformatted tape wherein the tape is prerecorded with particular code patterns utilized to effect subsequent control over recording and playback operations. Standards for tape drives and media development are published from time to time by organizations such as Quarter-Inch Cartridge Drive Standards, Inc. of Santa Barbara, California (herein referred to as QIC).

Data recorded onto data cartridges is generally organized into blocks, frames and tracks. A block may be defined as a group of 512 consecutive data bytes plus a header of eight control bytes recorded as a unit. A frame may be defined as a group of 64 blocks forming a complete logical unit. A track is a longitudinal area on the tape along which blocks may be serially recorded. Header information may be associated with each block and usually includes information such as the track identification number in addition to other types of information such as a preamble, post-amble, start of data marker and other useful information. However, blocks and headers are not present on fresh tapes where a fresh tape is considered herein to be a previously unused tape. Therefore, in the prior art, track identification numbers are not included for the data tracks on fresh tapes or on previously unused tracks of any tape.

One example of a data cartridge tape system is disclosed in U.S. Patent No. 4,424,111 to Moeller et al. issued Dec. 20, 1983. Moeller provides different digital key patterns each extending uniformly across the entire width of the tape to form key patterns identifying adjacent record locations.

Prior art tapes may also include reference bursts located at the beginning of each track for use in locating tracks. Such reference bursts may be recorded at a predetermined frequency as, for example, nominally 9688 FTPI for certain selected track locations such as zero and one, while other reference bursts are recorded with a nominal frequency of, for example, 19,375 FTPI. These reference bursts provide a signal which is identified by the head assembly control mechanism, enabling the mechanism to count the reference bursts transversely with respect to the longitudinal movement of the tape. Thus the reference bursts provide a mechanism for counting to a desired track number. The reference bursts, however, do not include any decipherable digital data and, in particular, do not include any digital data specifically indicating the track identification number. Further, reference bursts found in the prior art are not useful for other purposes such as tuning the tape cartridge read and write operations.

Another drawback of reference bursts found in the prior art is that track identification using such bursts is insufficient for tapes having high track density. Further, the prior art method does not positively identify every data track on the medium.

In addition to the mechanisms discussed hereinabove, proposed data cartridge recording formats have defined a prerecorded servo field or servo band to allow precise head positioning while recording data onto a medium. This servo format yields much higher track densities than can be achieved without the use of a head positioning servo mechanism.

For example, in U.S. Patent No. 5,008,765 to Youngquist issued April 16, 1991, a head positioning servo system is proposed which utilizes binary code patterns pre-recorded onto dedicated tracks that identify specific tracks so that upon playback, identification and servo positioning may be accomplished. In current QIC endorsed formats, however, the servo pattern does not contain absolute track identification information, and a specific track may only be indirectly located by counting tracks from a reference location such as the edge of the tape. Thus, the track acquired using the servo band information cannot be positively identified under all operating conditions and the resulting ambiguity may result in positioning the head on an incorrect data track.

If the target data track contains previously recorded user data, the track number can be verified by reading data from the medium. However, if the track does not contain previously recorded user data, as in the case of a fresh tape, for example, the track number cannot be so verified.

In the case where a data cartridge is to be recorded for the first time, all data tracks are blank. On such a fresh tape, each new recording operation on a data track is subject to the aforedescribed track identification ambiguity. Should a servo acquisition result in incorrect head positioning on a fresh data track, user data will be recorded on an incorrect data track, thereby decreasing the reliability of the recording process.

Referring now to Figure 1, a correct recording/playback head assembly position for recording at the beginning of a selected data track pair on a tape 140 is shown. The data track pair in this example comprises data tracks 60 and 24. A recording/playback head assembly 10 includes three transducers 12, 14, and 16, respectively. As there shown, transducers 14 and 16 are positioned to enable recording onto tracks 24 and 60, under servo position control of transducer 12 which reads the servo signal from a servo track 36. In this way, the recording/playback head assembly may be positioned by a servo mechanism similar to that shown in Figure 5, over a servo track such as servo track 36 in order to position the transducers 14, 16 on respective data tracks 60 and 24. In this example the reference characters associated with the tracks correspond directly to physical track locations in accordance with a standard track format. That is, track 60 may have physical location 60, track 24 may have physical location 24 and the servo track 36 may have physical track location 36.

Figure 2, in contrast to Figure 1, illustrates a case where the recording/playback head assembly 10 strays slightly off the desired servo track 36 onto an adjacent servo track 38. This causes the upper recording transducer 14 to be placed onto track 62 instead of the desired track 60. Similarly, the lower recording transducer 16 is erroneously placed onto track 26 instead of track 24.

As shown in Figure 2, a hypothetical track seek error has occurred which has placed the recording head 10 over an incorrect servo track, in this example, corresponding to physical track location 38. Since this error cannot be detected on

fresh media, a corrupt format results. The potential loss of user data occurs when the head records onto the erroneous track pair.

SUMMARY OF THE INVENTION

In contrast to the prior art, in one aspect, the present invention is a magnetic recording tape having recorded at the beginning of at least one of a plurality of longitudinal tracks therealong at least one frame of digitally encoded data representing the identity of the specific track.

In another aspect, the tape has recorded at the beginning of each of the plurality of longitudinal data tracks therealong a set up reference burst whereby a cartridge tape drive may fine tune its read and write operation..

In another embodiment, a recording/playback apparatus includes a recording/playback head assembly and a mechanism for transversely positioning the head with respect to a longitudinal transport path along which the tape may be moved. The apparatus further includes a network responsive to a playback signal from the head corresponding to the track identification frame recorded at the track at which said head is actually positioned for identifying the actual head position and for providing a correct position signal if the actual head position is not the same as the desired head position. A servo mechanism responds to the correct position signal and provides a positioning signal to the positioning mechanism for repositioning said head assembly at said desired track. The transverse position of the recording/playback head assembly may then be monitored in response to the track identification data to ensure positioning of the head assembly at a desired track, to prevent recording onto an incorrect track, and to prevent playing back data from an incorrect track

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more thoroughly described with reference to the accompanying drawings, wherein like numbers refer to like parts in the several views.

Figure 1 schematically shows a correct recording/playback head assembly position for recording at the beginning of a selected data track pair as might occur using prior art methods.

Figure 2 schematically shows an incorrect recording/playback head assembly position for recording at the beginning of a selected data track pair as might occur using prior art methods.

Figure 3 schematically shows track identification frames positioned at the beginning of a selected data track pair according to the present invention.

Figure 4 schematically shows user data recorded on a selected data track pair of a tape track, where each tape track includes a track identification frame and user data recorded in accordance with the present invention.

Figure 5 is a block diagram which schematically shows a tracking apparatus in accordance with the present invention.

Figure 6 schematically shows user data recorded on a selected data track pair of a tape where each track comprises a track identification frame and a set up reference burst in accordance with another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figure 3, an example of track identification frames recorded at the beginning of a selected data track pair on a fresh tape is shown schematically. A multitrack cartridge tape 140 includes a data track pair comprised of tracks 24 and 60, it being understood that such a tape, may for example, be 1/4" (0.635 cm) wide and carry 144 data tracks therealong arranged such that two of the heads 12, 14 and 16 access a selected track pair while the third head accesses the servo track 36. A first track identification frame 70 is recorded at the beginning of track 60 (i.e. a given distance, d, from load point (LP) hole 61) and a second track identification frame 72 is recorded at the beginning of track 24.

In one example, the track identification frames comprise 52 track identification blocks and 12 error correction code blocks. The track identification blocks share the same numbering system with user data blocks for physical block addresses. For example, the track identification frames may have block addresses on the upper end of the address range to facilitate differentiation from user data blocks.

In addition to track identification, which may comprise the first two bytes in each track identification block, other information may also be there included, such as the cartridge manufacturer's identification, cartridge serial number, cartridge manufacturing date, tape batch/lot number, mean coercivity of tape, LOT, and other information designated by the tape manufacturer or end user of the tape. Unused portions of the track identification blocks may be filled with zeros, for example. The track identification blocks may also be marked to contain no user data. Following the track identification frame, an end-of-data (EOD) marker 74, 76 is recorded on each track 60, 24.

The track identification frame may be prerecorded by the tape manufacturer, or, may be recorded by the data cartridge drive at the time the cartridge is first used, as desired. A tape manufacturer may fabricate preformatted data cartridges including both servo tracks and the track identification frames as contemplated by the present invention.

A tape manufactured according to the present invention uses a portion of the recording media for non-user data. In one example in which 144 data tracks are to be present, together with 24 servo tracks, 144 track identification frames may be recorded for track position verification. This corresponds to 3.83×10^6 bytes of capacity. For the QIC-10GB recording format, these track identification frames correspond to 0.038% of the total capacity. For the QIC-3GB recording format, these track identification frames correspond to 0.128% of the total capacity. If the track identification frames are recorded outside the normal recording area for user data, then capacity is not effected by the present invention.

It is possible to record the track identification frames on either end of the tape as required. Thus, in a format in which tracks are longitudinally arranged in a serpentine configuration even numbered tracks may be recorded starting from the beginning of tape (BOT) end of the tape, while odd numbered tracks and their associated track identification frames may be recorded starting from the end of tape (EOT) end of the tape.

In a typical operation, when a servo-formatted data cartridge is first inserted into a data cartridge drive, a drive controller steps the head assembly across the tape and locates the servo tracks. In accordance with the present invention, the drive controller also comprises the tape tracking system 100 described hereinbelow with

reference to Figure 5. The drive controller then positions the recording/playback head assembly to the first data track and attempts to read the first data frame from the medium. A data frame is read from the medium only if the cartridge has been recorded with user data, either partially or completely. The data frame contains the track identification number which is verified by a tape drive controller.

If a data frame cannot be read from the first track after a reasonable effort has been made, the medium is assumed to be unrecorded, or blank. The drive controller stores this fact in memory. When user data is to be recorded on the media, the drive controller moves the tape to the beginning of tape and records a track identification frame at the beginning of each data track if such a frame is not already present. The contents of each track identification frame includes, but is not limited to, the specific track identification number. The tape is also marked to indicate that that track contains no user data, by recording an end-of-data (EOD) marker on the track immediately following the frame.

Track identification frames may be recorded on a fresh tape by moving the tape to position the head assembly at the LP marker. The head assembly may be positioned over each track in turn using a known servo technique equivalent method. A track identification frame may be recorded at the beginning of each even numbered track. When a track identification frame has been recorded on each even numbered track, the tape is moved so as to position the head at the early warning (EW) hole 63. A track identification frame may then be recorded on each odd numbered track. Use of a multi-transducer head assembly allows recording track identification frames on multiple tracks simultaneously.

Referring now to Figure 4, user data 80, 82 is further shown to be recorded on a selected data track pair 60 and 24 having tape track identification frames 70, 72. A drive controller operated in accordance with this invention insures that each data track 60, 24 contains one of the track identification frames 70, 72 prior to recording any user data on the data track. When a data track is to be first recorded with user data from the beginning of the track, the drive controller first reads the track identification frame and verifies the track location on the medium. Upon successful verification that the head is positioned on the desired track location, the drive controller begins recording user data on that track. The drive controller then records user data following the track identification frame, without erasing the frame

and preferably without stopping the medium. This is desirable to the reliability of the procedure, since any stoppage of media may require another track seek and verification operation.

Referring now to Figure 5, a block diagram schematically shows an example of a tracking apparatus 100 in accordance with the present invention. A tape 140 comprises a servo band and multiple data tracks, each including a track identification frame 70, a remnant of end of data marker 74 and, in some cases, user data 80. The tracking apparatus 100 includes a recording/playback head assembly 10 for reading a selected servo track and selected data tracks as tape 140 moves longitudinally in either of the directions generally indicated by arrows 142, 144.

Elements used for processing prerecorded servo track patterns include a preamp 102, a servo demodulator 104 and a digital signal processor 112. The aforesaid components may be of conventional design and are assembled to form the servo tracking portion of the apparatus 100 in accordance with well known techniques.

Elements employed for processing the track identification frame data from tape 140 include two additional preamps 202, 218 and a dual channel data demodulator 204. A head positioning mechanism 136, mechanism control microprocessor 128 and system control microprocessor 134 are responsive to control signals provided by the digital signal processor. A tape transport mechanism 230 is connected to the mechanism control microprocessor to move the tape by conventional means as schematically indicated by broken line 232. It will be recognized that the heads 12, 14 and 16 of the head assembly 10 are multifunctional, such that, depending upon control signals from the system control microprocessor 134, the head assembly may be positioned such that any one of the respective heads is positioned on a selected servo track and is accordingly coupled to the designated servo preamp 108, the remaining heads then being coupled to the two data preamps 202 and 218.

In operation with respect to the servo track patterns, the servo preamp 102 receives a servo track signal 106 from the selected servo track band and outputs an amplified signal 108 to the servo demodulator 104.

The servo demodulator 104 responds to the signal 108 by providing a position error signal 110 to the digital signal processor 112. Digital signal processor

112 responds to the position error signal by generating a corresponding servo failure signal 122 to the mechanism control microprocessor 128 if the position error signal indicates that the selected head of the recording/playback head assembly is off the selected servo track.

In operation with respect to the track identification frames, when a selected head of the recording/playback head assembly 10 reads a track identification frame, one of the data preamps 202 receives a first track identification data signal 206 from a first selected data track and outputs a first amplified data signal 208 to the dual channel data demodulator 204. Similarly, the other data preamp 218 receives a second track identification data signal 216 from a second selected data track and provides a second amplified data signal 220 to a second input of the dual channel data demodulator 204.

The dual channel data demodulator 204 responds to signals 208 and 220 by providing an actual head position signal 210 to the system control microprocessor 134. The actual head position signal identifies the tracks at which the respective heads are actually positioned.

In addition to the actual head position signal 210, the system control microprocessor receives status information from the mechanism control microprocessor 128 on data line 132. The system control microprocessor may advantageously provide track select and motion control command signals 130, including position correction signals responsive to the actual head position signal 210 and to the status information on data line 132. If the actual head position signal 210 indicates that the head is positioned over a track which is not the desired track, then a position correction signal is transmitted to the mechanism control microprocessor. The mechanism control microprocessor 128 also generates servo control signals 124 which are processed by the digital signal processor 112 and which control locking of the recording/playback head assembly 10 onto a selected servo track.

The mechanism control microprocessor 128 generates a position adjustment signal 126 responsive to the servo lock failure signal 122 and to the track select control command signals 130. The head positioning mechanism receives the position adjustment signal 126 and provides an adjustment to the head position by a conventional means as, for example by operating a stepper motor to turn a lead screw as is indicated generally by broken line 138.

Referring now to Figure 6, user data is shown to be recorded on a selected data track pair 24 and 60 of a tape 140, where each track comprises a track identification frame 70, 72 and a set up reference burst 90, 92 in accordance with the present invention. The reference set up bursts 90, 92 are preferably recorded at the same time as the track identification frames 70, 76. It is to be understood that throughout this disclosure although only a few example tracks are shown, the reference burst and track identification frames may be advantageously applied to all tracks in a multiple track tape.

In one example of the invention using set up reference bursts, the set up reference bursts are written on a predetermined subset of selected tracks in a configuration corresponding to a particular head assembly pattern. These selected tracks must not be subsequently be overwritten because they are to be used as a recording parameter reference for later users of the cartridge. The remaining tracks not a part of the selected subset are also recorded with the reference burst pattern at the time of formatting. These tracks, however, may be overwritten and/or erased at any time.

The reference burst pattern consists of two consecutive recordings of equal length at constant, but different frequencies. The first frequency is identical to the "normal preamble" described in QIC-91-42 Rev. C, section 8.1.1 and consists of a bit pattern of alternating "1's" and "0's". This could alternately be described as a maximum flux density, high frequency pattern.

The first frequency component of the set up reference burst pattern may be written along the stated track beginning between 3 and 4 inches after the detection of the beginning of tape (BOT) tape hole pair (when traveling toward the end of tape (EOT)) for a minimum of 25 inches (63.5 cm). When writing odd tracks, the high frequency pattern may begin between 3 end 4 inches (10.2 cm) after the detection of the EOT hole (when traveling toward BOT) and continue until the pattern has been written for a minimum of 25 inches (63.5 cm). In the convention of this example, the track identification tracks 70, 72 begin at the load point (LP) hole 61 for even tracks and the early warning (EW) hole 63 for odd tracks. End of data markers 74, 76 and user data 80, 82 typically follow the track identification frames.

The second frequency component of the set up reference burst to be written is identical to the "elongated preamble" also described in QIC-91-42 Rev. C, section

8.1.1 consists of a bit sequence of alternating "1's" and 7 "0's" (i.e. 10000000). This signal may be described as being a Write Equalized F/4 pattern. This pattern is written immediately following the normal preamble until the detection of the load point hole or early warning hole, whichever is appropriate.

The dual frequency reference burst format enables the tape drive to fine tune its read and write operation to ensure tape interchangeability. The set up reference bursts are useful for cartridge drives which include a playback slimmer and formatter and which have the ability to adjust both read and write slimming before reading or writing of data begins. The formatter writes the original recording and this recording may advantageously conform to the QIC WEQ recording specification. Drives designed to write on this cartridge may be used in accordance with the following method steps:

A. Adjust the playback slimmer over two recording parameter set up reference bursts on a selected track pair so that the peak-to-peak amplitude of the two signals derived from the set up reference bursts are the same. The signals used must not be passed through an automatic gain control. This is otherwise known as a condition of 100% resolution.

B. Move the head to a new track where it is permissible to overwrite or erase the bursts. Erase the burst area on the new track and make a copy of one of the recording parameter reference bursts with a nominal write side resolution adjustment.

C. With the play resolution fixed to compensate the formatter's write resolution, test the resolution of the reference burst copy. If the copy does not have identical resolution to the formatter's resolution, write again and adjust the write side resolution appropriately. Test again, until the error between the copy and the recording parameter set up reference bursts from the originally selected tracks is sufficiently small.

If the above procedure is carried out on every cartridge insertion, all drives will write with substantially identical resolution. Having the format in place ensures that recordings may be calibrated if necessary.

The invention has been described herein in considerable detail in order to comply with the Patent Statutes and to provide those skilled in the art with the information needed to apply the novel principles and to construct and use such

specialized components as are required. However, it is to be understood that the invention can be carried out by specifically different equipment and devices, and that various modifications, both as to the equipment details and operating procedures, can be accomplished without departing from the scope of the invention itself.

CLAIMS

1. A magnetic recording tape having recorded at at least one end of each of a plurality of longitudinal data tracks therealong at least one frame of digitally encoded data representing the identity of each specific track, whereby the transverse position of a recording/playback head assembly transversely positionable with respect to a longitudinal transport path along which the tape may be moved may be monitored to ensure positioning of the head assembly at a desired track to prevent recording onto an incorrect track, and to prevent playing back data from an incorrect track.

2. The magnetic recording tape of claim 1 wherein the tape further comprises a plurality of servo tracks which are adapted for processing by a recording/playback head assembly positioning mechanism to allow precise head positioning at a selected track location while recording and playing back data onto that location.

3. The magnetic recording tape of claim 1 wherein the tape further comprises a plurality of reference set up bursts recorded adjacent the track identification frame on each track.

4. A magnetic recording/reproducing apparatus adapted for use with a magnetic recording tape having recorded at at least one end of each of a plurality of longitudinal data tracks extending along the tape at least one frame of digitally encoded data representing the identity of each specific track, said apparatus comprising:

(a) tape transport means for moving said tape along said transport path;

(b) a magnetic recording/playback head;

(c) means for transversely positioning said head at a selected end of one of said longitudinal data tracks proximate to a said track identification frame;

(d) means responsive to a playback signal from said head corresponding to the track identification frame recorded at the track at which said head is actually positioned for identifying said actual head position and for providing a correct position signal if the actual head position is not the same as the desired head position; and

(e) servo mechanism means responsive to the correct position signal for providing a positioning signal to the positioning means for repositioning said head assembly at said desired track.

5. A method for tape track verification for magnetic recording tape having a plurality of longitudinal data tracks extending along the tape in a tape cartridge drive including a transversely positionable magnetic recording/playback head, the method comprising the steps of:

(a) recording at least one end of each of the plurality of longitudinal data tracks at least one frame of digitally encoded data representing the identity of each specific track;

(b) moving said tape along a transport path;

(c) transversely positioning said head at a selected one of said longitudinal data tracks;

(d) playing back said track identification frame from the selected track to identify an actual head position and providing a correct position signal if the actual head position is not the same as the desired head position; and

(e) providing a positioning signal responsive to the correct position signal for repositioning said head assembly at said desired track.

6. The method of claim 5, adapted for use with a tape further comprising a plurality of servo tracks, the method further comprising the step of responding to the signals derived from at least one servo track to maintain precise head position while recording or playing back data onto and from a medium.

7. The method of claim 5 further comprising the steps of:

(a) reading the track identification frame;

(b) verifying the track location; and

(c) upon successful verification of track location then recording user data on the track following the track identification frame without erasing the track identification frame and without stopping the moving tape.

8. The method of claim 6 further comprising the steps of:

(a) reading the track identification frame;

(b) verifying the track location; and

(c) upon successful verification of track location then recording user data on the track following the track identification frame without erasing the track identification frame and without stopping the moving tape.

9. A method for fine tuning a tape cartridge drive including a playback slimmer, and a formatter having a read and a write resolution, the method comprising the steps of:

(a) recording a set up reference burst at the beginning of each of a plurality of longitudinal data tracks therealong;

(b) adjusting the playback slimmer over two set up reference bursts so that the peak-to-peak amplitude of the two signals derived from the set up reference bursts are the same;

(c) making a copy of one of the set up reference bursts with a nominal write side resolution adjustment;

(d) with the play resolution fixed to compensate the formatter's write resolution, testing the resolution of the reference set up burst copy; and

(e) if the reference set up burst copy does not have identical resolution to the formatter's resolution, writing again and adjusting the write side resolution appropriately and testing again, until the resolution of the reference set up burst copy substantially matches the formatter's resolution.

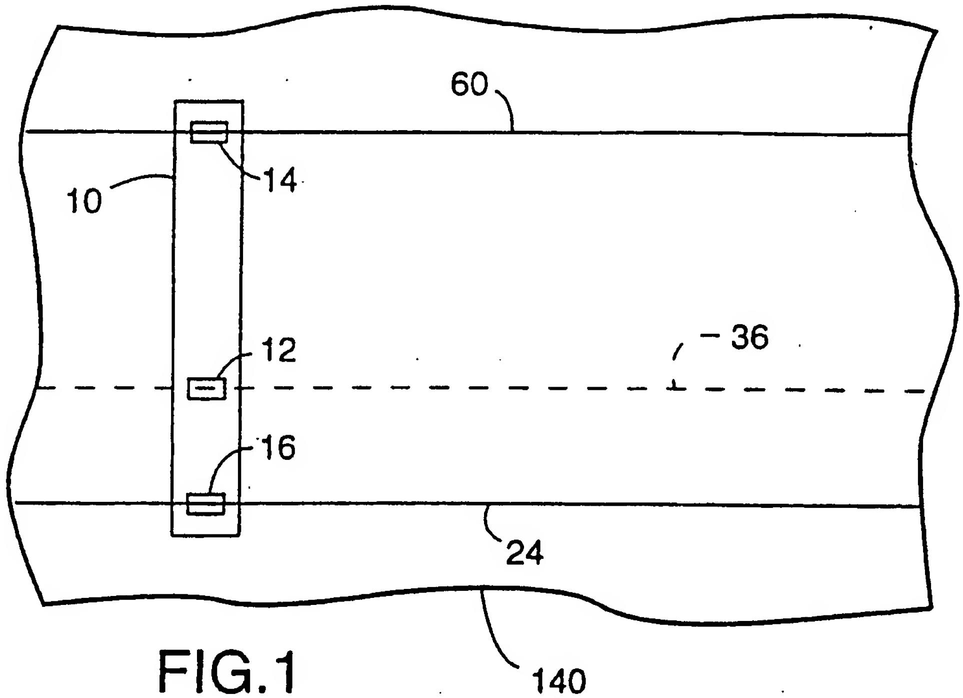

FIG.1
PRIOR ART

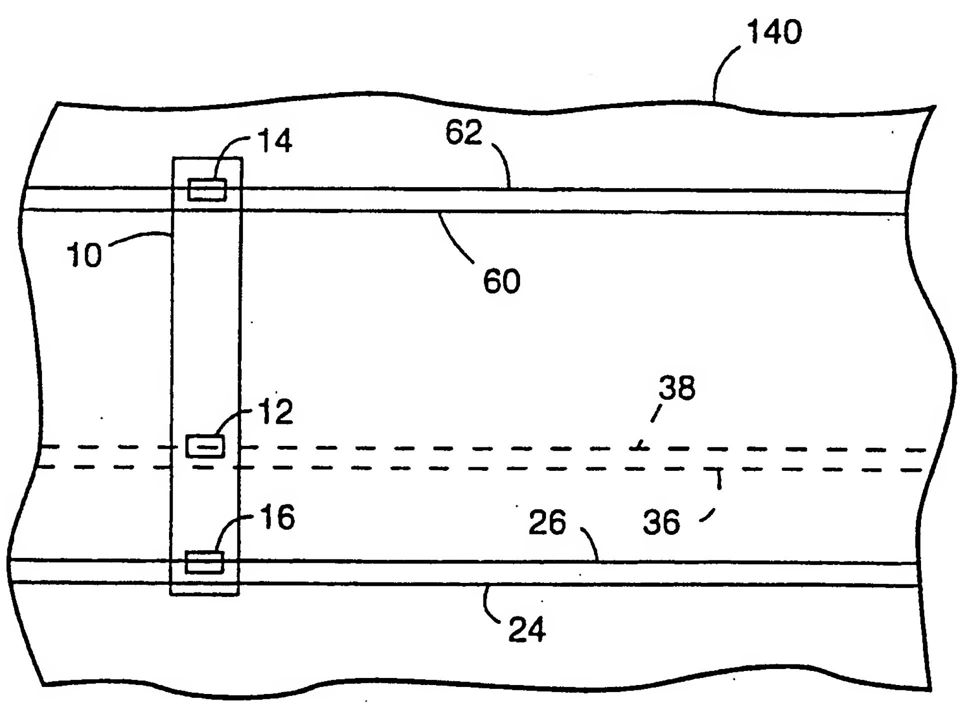

FIG.2
PRIOR ART

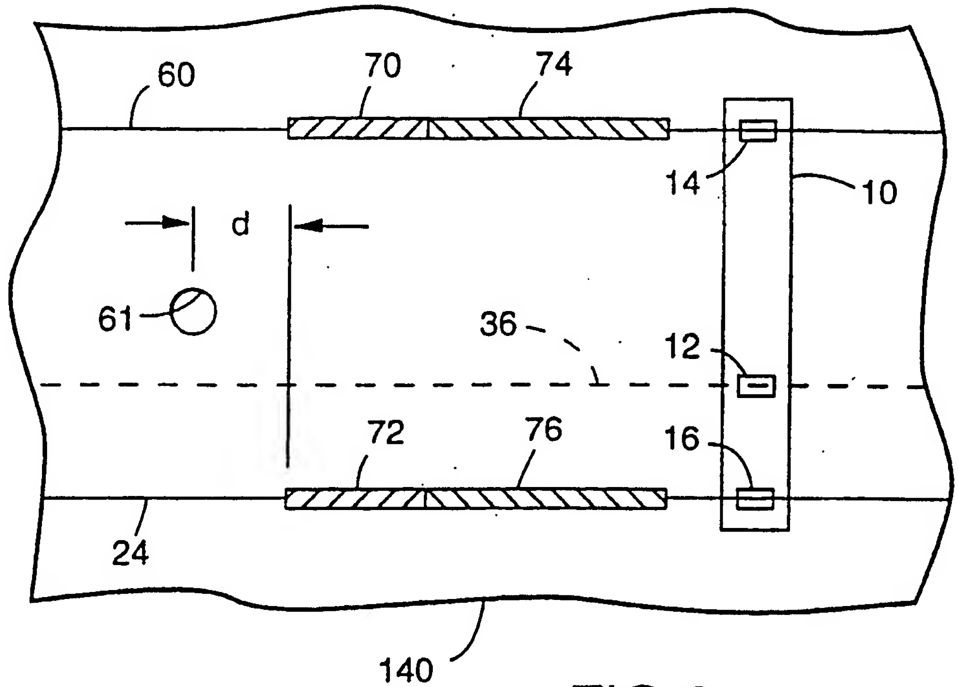

FIG.3

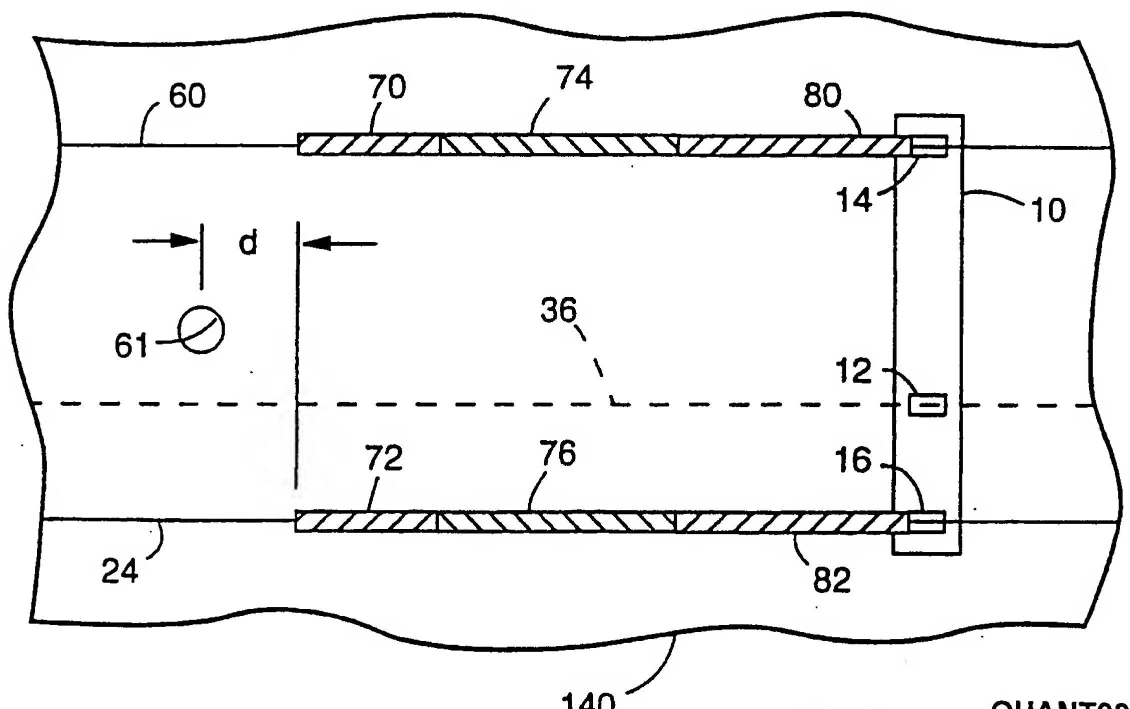

FIG.4

QUANT007662

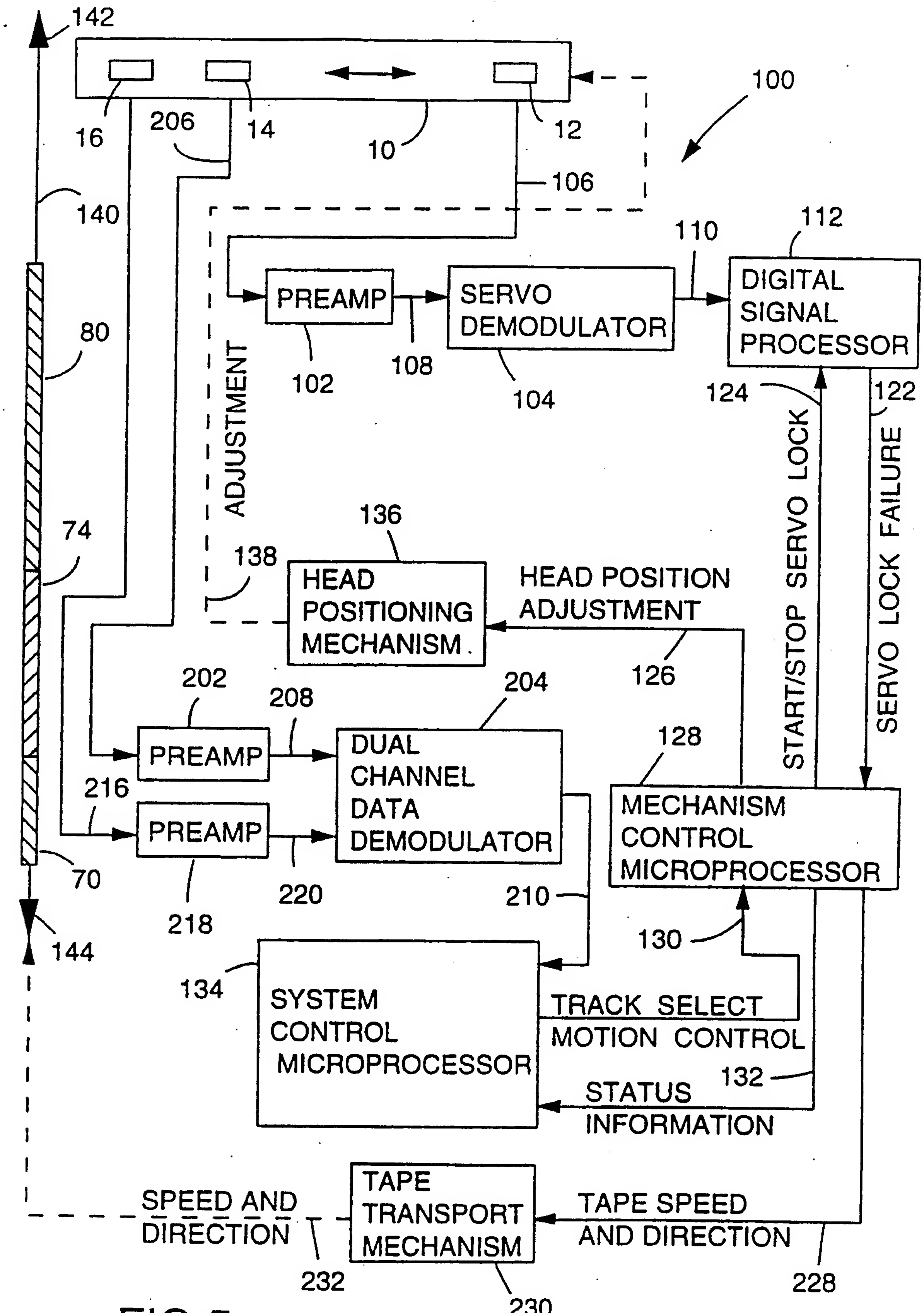

FIG.5

QUANT007663

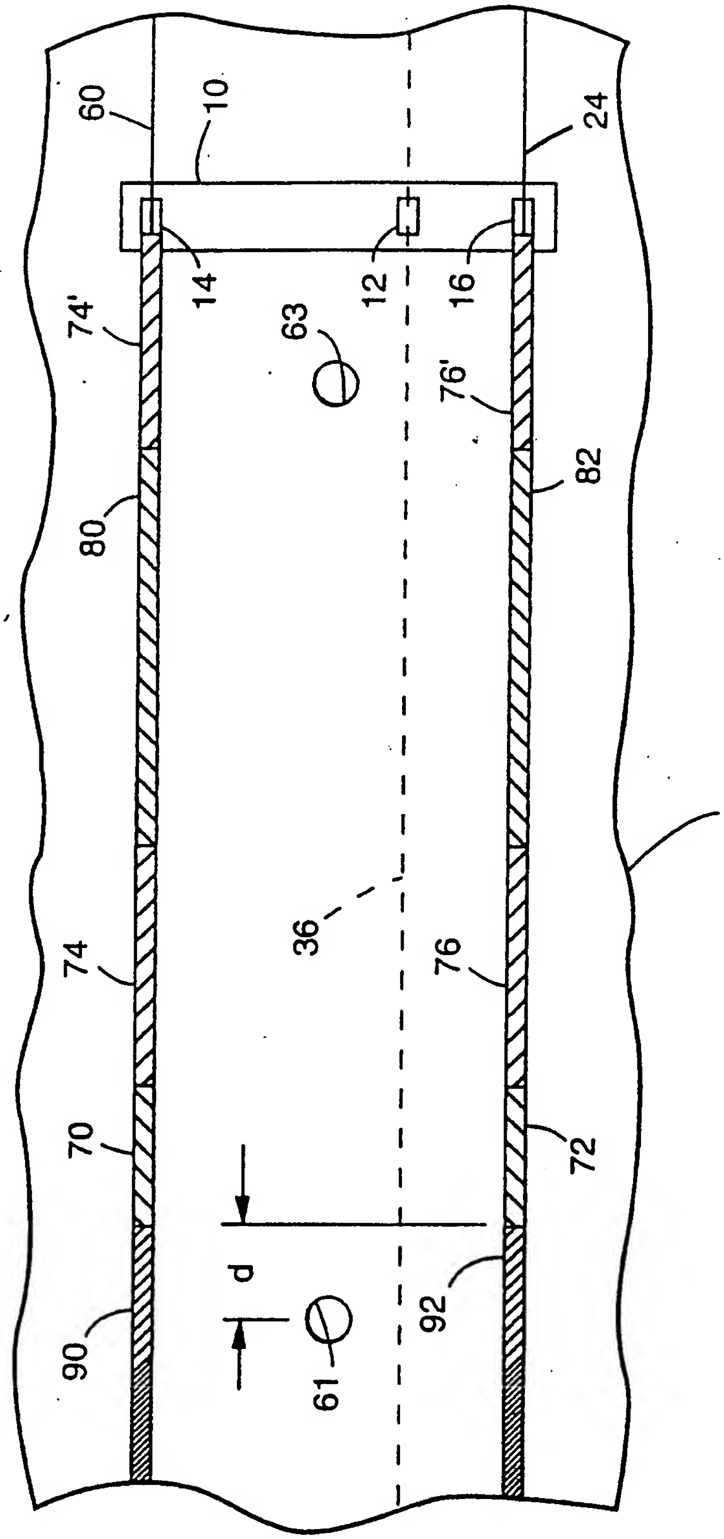

FIG.6

QUANT007664

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 G11B5/55

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 22, no. 230 (P-599)28 July 1987 & JP,A,62 042 353 (FUJITSU LTD.) 24 February 1987	1,3-5,7
A	see abstract	9
Y	EP,A,0 069 548 (IRWIN INTERNATIONAL INC.) 12 January 1983 see abstract see page 2, line 28 - page 4, line 2 see page 6, line 6 - page 7, line 13 see page 7, line 19 - page 8, line 24 see page 13, line 21 - page 14, line 26 see page 15, line 30 - page 17, line 24 see page 27, line 9 - page 29, line 8 see figures 3,5	1-8

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
14 February 1994	28.02.94

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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